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Application Date : 7th Aug., 1940. No. 2955/40.
(Sec. 63A : Including Cognate No. 1613/41.)

Applicant (Actual Inventor)	WILLIAM HERBERT KRANZ.
Application and Provisional Specification No. 2955/40	Accepted, 4th September, 1940.
Application and Provisional Specification No. 1613/41	Accepted, 30th July, 1941.
Complete Specification (Sec. 63A of the Patents Act 1903-1936)	Lodged, 6th June, 1941.
Complete Specification	Accepted, 30th July, 1941.
Acceptance Advertised (Sec. 50) ..	14th August, 1941.

Classes 66.5 ; 67.1 ; 69.6 ; 62.7.

Drawing attached.

COMPLETE SPECIFICATION.

"Improvements in and relating to superchargers for engines driven by producer or similar gas."

I, WILLIAM HERBERT KRANZ of Laura, State of South Australia, Commonwealth of Australia, Motor and Electrical Engineer, British Subject, hereby declare this invention, and the manner in which it is to be performed, to be fully described and ascertained in and by the following statement:—

This invention relates to improvements in superchargers for engines driven by producer or similar gas where it is desirable to feed the engine under pressure and also to maintain the correct supply at varying operational speeds of the engine and sometimes, as in the case of mobile units, when the engine is not in operation for short periods. The invention has been particularly designed for use with mobile suction gas units such for instance as are used in road vehicles or tractors.

The principal object of the invention is to provide a supercharger which will function to produce the correct gas pressure at all speeds of the engine and moreover will do this in a simple and trouble free manner. A further object is to provide means whereby the supercharger may be actuated when the engine itself is not functioning.

With the above objects in view my invention comprises a blower in the gas line and a turbine in the exhaust line, the rotor of the turbine being rotationally coupled to the rotor of the blower so that the drive will be transmitted from the one to the other. A feature is the spacing apart of the blower and turbine. A further feature is the arranging of the turbine to cause the blades to be moved in the direction of travel of the exhaust gases. A still further feature is an electrical drive which may operate the unit when the exhaust turbine is not functioning as the driving medium, the electric motor driving the unit through a clutch which automatically allows the motor to be stopped when the drive is being applied by the turbine.

In order however that the invention may be more clearly understood embodiments of

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same will now be described with reference to the accompanying drawings in which:—

Fig. 1 is a perspective view of a unit constructed according to the invention,

Fig. 2 is a central section of same,

Fig. 3 is a sectional end elevation, the left half of the section being taken on a plane through the centre of the turbine and the right half of the section being taken on a plane through the centre of the blower;

Fig. 4 is a sectional view of a modified form of turbine,

Fig. 5 shows how the electrical drive may be applied to the invention,

Fig. 6 shows a modified form of electrical drive, and

Fig. 7 is an elevation of the means shown in Fig. 6 but showing the bearing members in section.

The turbine 1 comprises a two-part casing 2–3 provided with an inlet 4 and an outlet 5. The two parts 2 and 3 of the casing form between them an annular channel 6 in which the blades 8 of the rotor are disposed, the blades being cup-shaped and being supported upon a central web 9 which is carried upon a shaft 10 supported in bearings 11 and 12 in a housing member 13 held in a clamp socket 14 joined by arms 15 to the member 3 of the casing.

From the drawings it will be seen that the blades 8 of the turbine rotor fit neatly into the channel 6, the gas inlet 4 and gas outlet 5 joining the channel tangentially so that the gas passes round that portion of the channel between the inlet and the outlet and in so doing carries the rotor around with it by reason of the disposition of the blades 8 in the channel 6. The housings and the rotor are symmetrical about the centre line 16 shown in Fig. 3.

The members 2–3 of the casing are provided with cooling fins 18, while the bearing 11 is protected by means of a fan 20 upon the shaft 10, the fan serving to circulate air between the turbine and the bearing and being arranged either to draw or blow the air over the bearing.

Held to the other end of the housing member 13, by means of a clamping socket 22, is the casing 23 of the blower unit 24, the casing having upon it a cover plate 25 and having within it a rotor comprising cheeks 26 and 27 between which are disposed a series of curved blades 28 which cause the required air pressure to be generated. The rotor is secured upon the end of the shaft 10. An inlet 30 and an outlet 31 are provided.

Referring now to the modification shown in Fig. 4. The turbine in this comprises a casing 35 within which is a rotor comprising curved blades 36. The housing 35 is provided with a cover plate 38 upon which is arranged an inlet 39, a series of nozzles 40 causing the gas to enter through the cover plate 38 and impinge against the blades 36 in the direction in which they are to be driven, the gases leaving the housing 35 through the outlet 41. In both this form and that first described the action of the exhaust gases is similar, namely, the gases impinge against the blades and carry them around in approximately the same direction as the gases are travelling, in this way preventing or minimising wear due to friction between the blades and carbon particles and gases, and also ensuring a ready energy transfer between the gases and the blades.

The gas inlets, instead of being arranged in the cover plate, may be arranged in the periphery of the casing 35. The blades are preferably provided with a cheek on the side of the casing opposite to the nozzles 40 to form a series of pockets between the blades.

In Fig. 5 of the drawings is illustrated the method of driving the unit when the turbine is not operating, the device in this case comprising an electric motor 45 secured upon an extension 46 upon the housing member 13A which carries the bearings 11A and 12A of the shaft 10A.

The shaft of the motor 45 has upon it a skew gear 48 which meshes with a skew gear 49 upon the shaft 10A, the skew gear 49 being free to revolve upon the shaft 10A but being confined between a collar 47 upon the one side and a collar 50 upon the other side, the collar 50 having a series of sloping faces 51 between which and a race 52 upon the skew gear 49 a series of ball members 53 are disposed to form a one-way clutch between the skew gear 49 and the shaft 10A.

The operation of a clutch as described is well known, the ball members serving to jamb between the member 50 and the race

52 when the race 52 is revolved in a clockwise direction by the motor but releasing when the member 50 is revolved in a clockwise direction by the turbine.

According to the modification shown in Figs. 6 and 7 the electric motor 45A is supported upon a member 13B which supports the bearings 11B and 12B of the shaft 10B.

The drive is transmitted from the motor 45A through a pair of friction wheels 60 and 61, the wheel 60 being mounted upon the motor shaft and the wheel 61 upon the shaft 10B.

The motor 45A is carried upon a hinge pin 62 which permits it to be rocked to bring the friction wheel 60 into and out of engagement with the wheel 61, the drive normally being disconnected by the pressure exerted by the spring 63 but being pulled into engagement when drive is to take place by the solenoid 64 which has its armature coupled to the motor by means of a connecting rod 65. The motor and the winding of the solenoid can conveniently be in series so that energisation of the motor automatically causes same to be moved over to engage the drive.

The shaft of the turbine may be extended through the part 2 of the casing and the motor placed in line with this and coupled thereto by a suitable clutch.

From the foregoing it will be appreciated that a supercharger has been provided which will operate at a speed varying in proportion to the exhaust pressure of the engine, this feature being desirable when supercharging an engine running on producer gas. The supercharger is not subject to the difficulties which exist when a supercharger is mechanically coupled to a revolving part of the engine, the turbine being more flexible than mechanical transmission and having the added advantage of varying in proportion to the pressure of the exhaust gases of the engine.

It is found in practice that the turbine acts as a silencer so that the normal engine silencer may be omitted or modified thereby maintaining the back pressure in the exhaust line at about the same value as that existing with an ordinary silencer, that is to say the turbine does not increase or materially increase the back pressure which would exist in an ordinary installation.

The advantage of the additional electrical drive is that when a suction gas driven engine is stopped for short periods such drive may be switched on and the blower caused to function to maintain the supply of gas during the period at which the engine is not running so that the engine may again be immediately started up on gas without using liquid fuel as is usually necessary in an engine not fitted with means to maintain the gas supply. The electrical drive may also be used to supply suction to start the gas producer so that it is unnecessary to use liquid fuel at any time.

Instead of using an electrical drive to maintain the supply of gas it would be possible to provide a manual drive in the form of a handle geared to the blower shaft in a sufficiently great ratio to provide the necessary speed for the blower.

Having now fully described and ascertained my said invention and the manner in which it is to be performed I declare that what I claim is:—

1. For internal combustion engines driven by producer or similar gas an improved supercharger comprising; a turbine in the exhaust line, a blower in the gas line, and means rotationally coupling the rotor of the turbine to the rotor of the blower. Application No. 2955 dated the 7th August, 1940.

2. For internal combustion engines driven by producer or similar gas an improved supercharger comprising; a turbine in the exhaust line, a blower in the gas line, a shaft rotationally coupling the rotor of the turbine and the rotor of the blower, and bearings supporting such shaft interposed between the turbine and the blower. Application No. 2955 dated the 7th August, 1940.

3. For internal combustion engines driven by producer or similar gas an improved supercharger comprising; a turbine in the exhaust line said turbine being arranged to have its blades driven around by the exhaust gases by causing the gases to impact the blades in approximately their direction of travel, a blower in the gas line, and means rotationally coupling the rotor of the turbine to the rotor of the blower. Application No. 2955 dated the 7th August, 1940.

4. For internal combustion engines an improved supercharger comprising; a turbine in the exhaust line said turbine comprising a casing and a rotor, a blower in the gas line said blower comprising a casing and a rotor, means interconnecting the

casing of the turbine and the casing of the blower to space same apart, a shaft supporting the rotor of the turbine and the rotor of the blower and rotationally coupling same, and bearings supporting the said shaft in the means which interconnect the casings. Application No. 2955 dated the 7th August, 1940.

5. For internal combustion engines an improved supercharger comprising; a turbine in the exhaust line said turbine comprising a casing and a rotor, a blower in the gas line said blower comprising a casing and a rotor, means interconnecting the casing of the turbine and the casing of the blower to space same apart, a shaft supporting the rotor of the turbine and the rotor of the blower and rotationally coupling same, bearings supporting the said shaft in the means which interconnect the casings, and a fan interposed between the casing of the turbine and the bearings which support the said shaft. Application No. 2955 dated the 7th August, 1940.

6. For internal combustion engines driven by suction gas an improved supercharger comprising; a turbine in the exhaust line said turbine being arranged to have its blades driven around by the exhaust gases by causing the gases to impact the blades in approximately their direction of travel, a blower in the gas line, means coupling the casing of the turbine and the casing of the blower to space same apart, a shaft to support the rotor of the turbine and the rotor of the blower, and bearings for the shaft interposed between the turbine and the blower. Application No. 2955 dated the 7th August, 1940.

7. For internal combustion engines an improved supercharger according to any preceding claim comprising; a two-part casing for the turbine, an annular channel between the parts of such casing, a rotor within such casing having cup shaped blades disposed within the channel, a tangentially arranged inlet to the channel, and a tangentially arranged outlet from the channel to cause the gases to circulate from the inlet around part of the channel and through the outlet. Application No. 2955 dated the 7th August, 1940.

8. For internal combustion engines an improved supercharger according to Claim 1, 2, 3, 4, 5 or 6 characterised by; a casing for the turbine, a rotor within such turbine comprising a series of blades, an inlet to the casing having a series of nozzles arranged to project the gas in approximately the direction of travel of the rotor blades, and a tangential outlet from the casing. Application No. 2955 dated 7th August, 1940.

9. For internal combustion engines an improved supercharger according to any preceding claim comprising; a casing for the blower, a cover plate for such casing having a central inlet, a rotor within the casing comprising cheeks and curved blades therebetween, and a tangential outlet from such casing. Application No. 2955 dated the 7th August, 1940.

10. For internal combustion engines driven by producer or similar gas and embodying a supercharger comprising a turbine in the exhaust line and a blower in the gas line improvements consisting in; electrical driving means arranged to drive the blower, and clutch means to disconnect the electrical driving means when the blower is driven by the turbine. Application No. 1613 dated the 31st May, 1941.

11. For internal combustion engines driven by producer or similar gas and embodying a supercharger comprising a turbine in the exhaust line and a blower in the gas line improvements consisting in; electrical driving means for the blower, driving means upon the shaft of the motor, co-operating driving means upon the shaft of the blower, and clutch means to disconnect the electrical driving means when the blower is driven by the turbine. Application No. 1613 dated the 31st May, 1941.

12. For internal combustion engines driven by producer or similar gas and embodying a supercharger comprising a turbine in the exhaust line and a blower in the gas line improvements consisting in; electrical driving means for the blower, a skew gear driven by the electrical means, a co-operating skew gear rotatable upon the shaft of the blower, and clutch means between the rotatable skew gear upon the shaft and the shaft to disconnect the electrical driving means when the blower is driven by the turbine. Application No. 1613 dated the 31st May, 1941.

13. For internal combustion engines driven by producer or similar gas and embodying a supercharger comprising a turbine in the exhaust line and a blower in the

gas line improvements consisting in; electrical driving means for the blower, a friction wheel driven by the electrical driving means, a co-operating friction wheel upon the shaft of the blower, and means to engage the one friction wheel with the other when electrical drive is to take place. Application No. 1613 dated the 31st May, 1941.

14. For internal combustion engines driven by producer or similar gas improvements as set forth in Claim 13 characterised in that the one friction wheel is mounted upon the shaft of the motor and that the motor is movable to bring the friction wheel into engagement with the other friction wheel by a solenoid coupled to move the motor. Application No. 1613 dated the 31st May, 1941.

15. For internal combustion engines driven by producer or similar gas an improved supercharger constructed and operating substantially as described and illustrated with reference to Figs. 1, 2 and 3. Application No. 2955 dated the 7th August, 1940.

16. For internal combustion engines driven by producer or similar gas an improved supercharger having a turbine constructed and operating substantially as described and illustrated with reference to Fig. 4. Application No. 2955 dated the 7th August, 1940.

17. For internal combustion engines driven by producer or similar gas improved driving means for an exhaust driven supercharger constructed and operating substantially as described with reference to Fig. 5 of the drawings. Application No. 1613 dated the 31st May, 1941.

18. For internal combustion engines driven by producer or similar gas improved driving means for an exhaust driven supercharger constructed and operating substantially as described with reference to Figs. 6 and 7 of the drawings. Application No. 1613 dated the 31st May, 1941.

Dated this 12th day of June, 1941.

WILLIAM HERBERT KRANZ,
By his Patent Attorneys,
COLLISON & CO.,
Fellows Institute of Patent Attorneys of Australia.

Witness—L. H. Paul.

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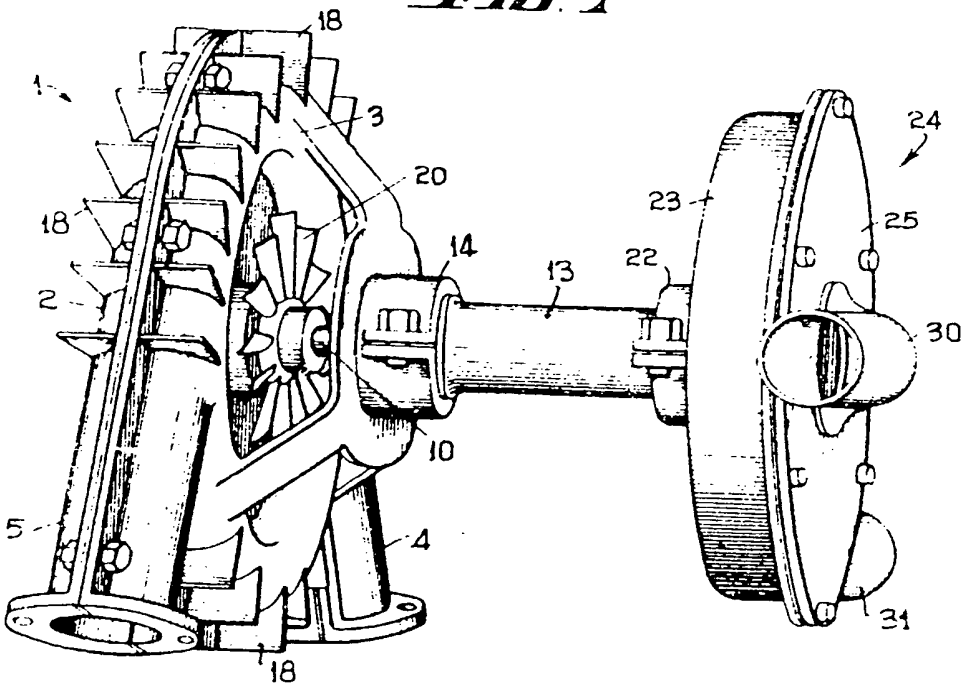
FIG. 1



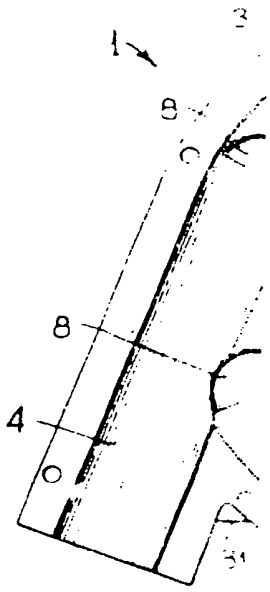
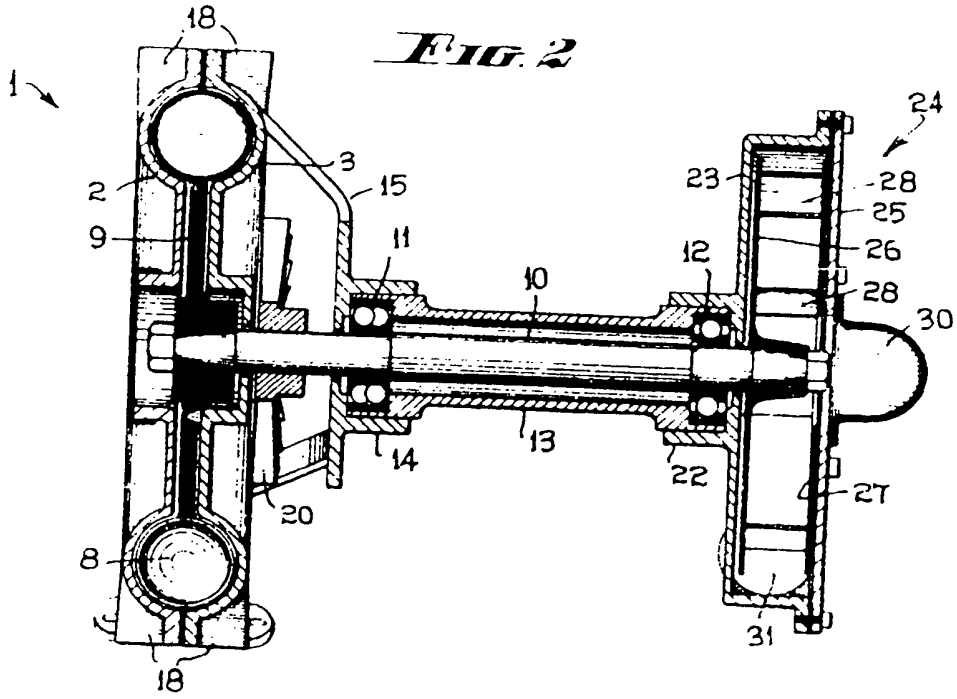


FIG. 2



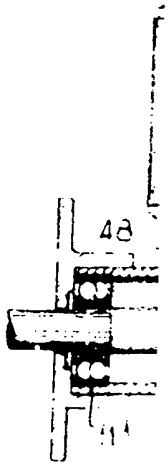


FIG. 3

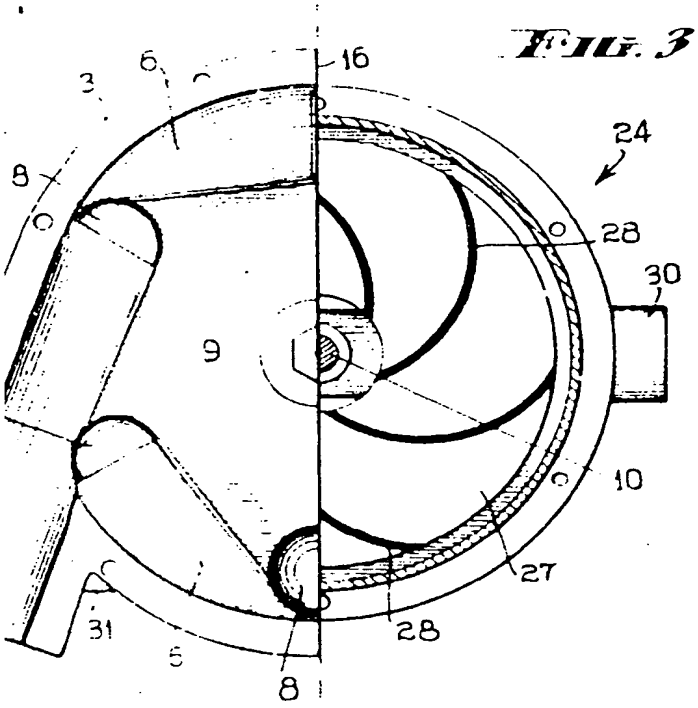


FIG. 4

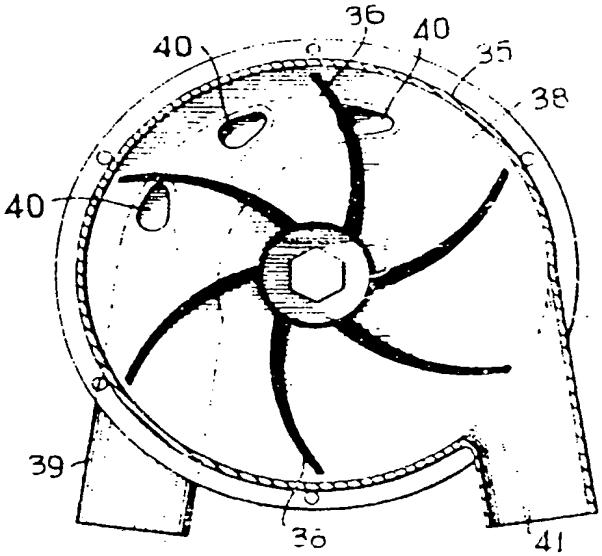


FIG. 6

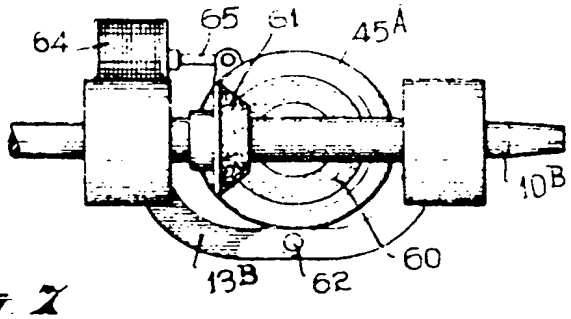


FIG. 5

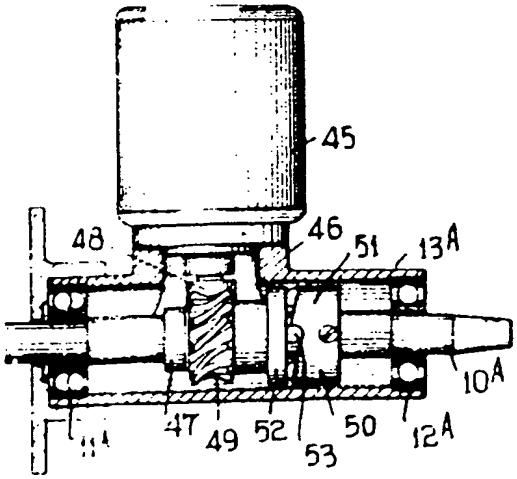


FIG. 7